



## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification<sup>6</sup> :B29C 49/06, 49/30, 49/70 // B29K 67:00,  
B29L 22:00

A1

(11) International Publication Number:

WO 96/30189

(43) International Publication Date:

3 October 1996 (03.10.96)

(21) International Application Number: PCT/NZ96/00022

(22) International Filing Date: 21 March 1996 (21.03.96)

(30) Priority Data:

270846	31 March 1995 (31.03.95)	NZ
280976	13 February 1996 (13.02.96)	NZ

(71) Applicant (for all designated States except US): CARTER  
HOLT HARVEY LIMITED [NZ/NZ]; 640 Great South  
Road, Manukau City, Auckland (NZ).

(72) Inventor; and

(75) Inventor/Applicant (for US only): PRYOR, Raymond, John  
[NZ/NZ]; 75 Alderson Road, Hamilton (NZ).(74) Agents: BENNETT, Michael, R. et al.; A J Park & Son,  
Huddart Parker Building, 6th floor, Post Office Square, P.O.  
Box 949, Wellington 6015 (NZ).(81) Designated States: AL, AM, AT, AU, AZ, BB, BG, BR, BY,  
CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IS,  
JP, KE, KG, KP, KR, KZ, LK, LR, LS, LT, LU, LV, MD,  
MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD,  
SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, US, UZ, VN,  
ARIPO patent (KE, LS, MW, SD, SZ, UG), Eurasian patent  
(AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent  
(AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU,  
MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM,  
GA, GN, ML, MR, NE, SN, TD, TG).

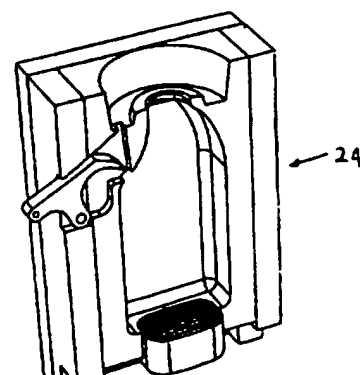
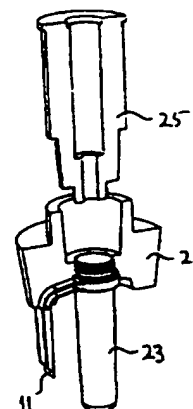
Published

With international search report.

(54) Title: BLOW-MOULDING HANDLED CONTAINERS IN PET OR LIKE PLASTICS AND RELATED PREFORMS, METHODS  
AND APPARATUS

## (57) Abstract

The manufacture of a bottle by stretch blowing involving in a first mould assembly, creating a preform having adjacent but below a threaded neck region, a handle or a precursor for a handle having a distal extremity in a second mould assembly, stretch blowing the barrel region of the preform to define said bottle, and wherein (i) said preform after creation in said first mould assembly is manoeuvred by said neck and/or said handle by part(s) of said first mould assembly into a two part blow mould for said barrel region and is indexed relative to the centre line thereof by reference to the handle, said two part blow mould (plus its blow nozzle) and said part(s) of first mould assembly form at least part of said second mould assembly, and/or (ii) in the stretch blow moulding step, means deflects the tang or extremity of the handle inwardly towards the remainder of the preform for a sufficient period and is such a way as to enable a better wrap around of the handle extremity by the body of the bottle or container being blown from said barrel region.



**FOR THE PURPOSES OF INFORMATION ONLY**

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AM	Armenia	GB	United Kingdom	MW	Malawi
AT	Austria	GE	Georgia	MX	Mexico
AU	Australia	GN	Guinea	NE	Niger
BB	Barbados	GR	Greece	NL	Netherlands
BE	Belgium	HU	Hungary	NO	Norway
BF	Burkina Faso	IE	Ireland	NZ	New Zealand
BG	Bulgaria	IT	Italy	PL	Poland
BJ	Benin	JP	Japan	PT	Portugal
BR	Brazil	KE	Kenya	RO	Romania
BY	Belarus	KG	Kyrgyzstan	RU	Russian Federation
CA	Canada	KP	Democratic People's Republic of Korea	SD	Sudan
CF	Central African Republic	KR	Republic of Korea	SE	Sweden
CG	Congo	KZ	Kazakhstan	SG	Singapore
CH	Switzerland	LI	Liechtenstein	SI	Slovenia
CI	Côte d'Ivoire	LK	Sri Lanka	SK	Slovakia
CM	Cameroon	LR	Liberia	SN	Senegal
CN	China	LT	Lithuania	SZ	Swaziland
CS	Czechoslovakia	LU	Luxembourg	TD	Chad
CZ	Czech Republic	LV	Latvia	TG	Togo
DE	Germany	MC	Monaco	TJ	Tajikistan
DK	Denmark	MD	Republic of Moldova	TT	Trinidad and Tobago
EE	Estonia	MG	Madagascar	UA	Ukraine
ES	Spain	ML	Mali	UG	Uganda
FI	Finland	MN	Mongolia	US	United States of America
FR	France	MR	Mauritania	UZ	Uzbekistan
GA	Gabon			VN	Viet Nam

## **“BLOW-MOULDING HANDLED CONTAINERS IN PET OR LIKE PLASTICS AND RELATED PREFORMS, METHODS AND APPARATUS”**

### **TECHNICAL FIELD**

5       The present invention relates to improvements in and or relating to blow-moulding handled containers in PET or like plastics and related preforms, methods and apparatus.

### **BACKGROUND ART**

While handles have been capable of being integrally provided on extrusion blow-moulded products made from a variety of plastics, it has not until very recently been  
10 possible to provide (useful for decanting from the bottle or container) integral handles utilising ISB Technology where the material is of biaxially oriented PET plastics or a plastic having similar moulding characteristics.

PET for containers has certain advantages in that it can provide very thin walled bodies to the containers provided there has been crystalline orientation of a required type  
15 during the blow-moulding.

Examples of extrusion blow moulded products that have integral handles abound, see, for example, New Zealand Registered Design Nos, 8122, 9923, 12497, 17569, 18238, 18795, 20395, 20597, 21127, 21317, 21921, 22345, 22802, 22807, 22809, 22950, 25603, and 24739.

20       One approach to the provision of a handle on a biaxially oriented PET bottle has been that of Labplas NZ Ltd which uses a castellate or bayonet type engagement of a moulded handle structure with the already stretch blow-moulded bottle. See for example, New Zealand Registered Design No. 24233.

Another approach with biaxially oriented PET has been the in-mould location of  
25 a premoulded handle form and the subsequent mechanical capturing and/or melding therewith of the container being blown from a standard preform. In this respect see New Zealand Registered Design No. 23888.

UK Patent Application GB 2041286A of Yoshino Kogyoshi Co disclosed a synthetic resin (eg. a saturated polyester resin) bottle being created by the steps of

30       (i) injection moulding a parison with a handle integrally moulded to extend

from lower regions of the parison neck, and

(ii) then after heating the parison and the blowmould biaxially orienting the container during the blowing. The handle form required must be protected during the blow moulding process by complex mould parts and the only embodiment envisaged  
5 where the handle connects top and bottom to the completed bottle is where the parison itself is moulded with the handle already so connected.

PCT/US81/00056 [WO82/02369] of M. Thompson discloses a variant of the process of GB 2041286A where the handle in the completed bottle is connected top and bottom, yet in the parison or preform, was not ie. injection moulded to be integrally  
10 connected at the top only. It also discloses forms (eg. Figure 3) where the handle form is protected during blow moulding between mould parts that require axial separation (with respect to the bottle axis), and forms (Figures 5 to 9) where during blow moulding causes the expanding preform to conform to the handle extremity in the same manner as it does to the mould so as to key the barrel of the bottle to the handle extremity.

15 Figure 16D of WO82/02369 shows a variant of the Figure 5 to 9 form where mould pieces as shown in Figures 17A to 17C coact to axially (with respect to the preform/bottle axis) force. The handle of the preform into a cavity defined by mould halves for blow moulding the barrel of the bottle, the mould halves being separable laterally of the preform/bottle axis.

20 EPA 0061511 A1 of Ethyl Corporation discloses the injection moulding of a handled preform, its optional heat conditioning prior to blow moulding, and its blow moulding while the preformed handle remains protected. It does not show means of capturing the extremity of the preformed handle by the barrel of the blown bottle.

Japanese Patent (1994)6/99986 of Toppan Insatsu Co (published 12 April 1994)  
25 discloses the blow moulding of a preform to capture a separately injection moulded handle as well as the blow moulding of a handled preform having at its extremity a handle fixing sheet during the blow moulding step which presents a heat sensitive adhesive layer to the barrel of the bottle being blown so as to trap the handle extremity between the fixing sheet and the barrel.

### 30 DISCLOSURE OF INVENTION

The present invention provides for a procedure and related components, methods

and apparatus which enables PET to be moulded, brought at least momentarily to a preform stage and then to be indexed into a mould for stretch blow-moulding to provide a stretch blow-moulded container or bottle (hereafter "bottle") which includes an integral handle extending from the shoulder or neck (hereafter "neck") thereof. Such a procedure  
5 can, in at least some embodiments, fix the lower extremity of the preform handle to the blown barrel. As such the present invention should at least provide the public with a useful choice.

Preferably the preform to be used is of a plastics material (preferably of PET), preferably at above stretch blow moulding temperature(s), said preform being of a form  
10 capable of being stretch blow moulded to form a bottle or container (hereafter "bottle") having a closure engageable (eg; screw threaded) neck with the mouth or opening of said bottle to be formed and having a handle or a precursor form thereof integrally formed as part of said preform extending from or adjacent the closure engageable neck.

Preferably said handle integrally formed as part of said preform has a distal region,  
15 ie; does not return to be integral with the preform elsewhere.

Preferably said distal region of said handle is to be encompassed by blown parts of said preform (ie; the bottle body) so as to provide at least a mechanical capturing thereof (eg; wrap around).

Preferably said preform is indexable to the centre line of a two part mould of a  
20 injection stretch blow moulding machine by reference to and/or use of said handle or precursor form thereof.

Preferably said preform is of PET and is of a form substantially as hereinafter described.

Preferably said preform has the handle integrally formed as part of said preform  
25 with a distal region, said distal region being at the end of a tang region of said handle that extends substantially parallel to (any or) the general longitudinal axis of that part to be blow moulded into the body of the bottle or container.

Preferably that portion of the preform to be blow moulded to form a bottle or container is substantially circular in cross section.

30 Preferably said substantially circular section is substantially an annulus section save near the base thereof.

Preferably said substantially annular section is slightly tapered to a reduced overall girth near the bottom thereof, ie. that end remote from the opening.

Preferably said tang region of said handle of the preform extends from a shoulder-like part of the handle that is integral from the neck or adjacent the neck of the preform.

5 Preferably said integral shoulder-like part at or near said neck to said tang (remote from the distal end thereof) is substantially rigid, ie. preferably more rigid than the tang region or preferably it deforms only slightly under loadings on the distal end region of said tang, notwithstanding some deflection of the handle.

Preferably said handle is of a form such that

10 (a) it can be injection moulded,

(b) at least said shoulder-like part has a part line that extends along said handle in a plane that includes the general longitudinal axis of that portion of the preform to be blow moulded to form a bottle or a container,

(c) a two part tool defines or can define at least the threaded region of the preform,  
15 such two part mould having a separation axis that is substantially in the plane of said general longitudinal axis of that portion of the preform to be blow moulded to form a bottle or container and preferably also includes said part line of said shoulder-like part of said handle,

(d) a single mould member only is required internally of that portion of the preform  
20 to be blow moulded to form said bottle or container, and/or

(e) the assembly of mould parts to define the exterior of the majority of the portion of the preform to be blow moulded to form a bottle or container and the tang region of the handle of the preform is such as to allow the removal from such a mould assembly of the preform when sufficiently cooled by means of co-acting mould pieces exteriorly of the  
25 threaded region thereof which have moulded such threaded region and preferably at least the exterior or said shoulder-like part.

In some forms said preform may be of a configuration (save for the integral handle form extending from the neck) substantially as disclosed in, by way of example, US Patent Specification No. 4588620 of Emhart Industries, Inc.

30 The injection stretch blow moulded plastics container of the present invention

(preferably of PET) is blow mouldable to have a closure engageable neck to close the mouth or opening thereof and has extending from adjacent to the neck (ie; the "shoulder") an integral handle preferably integral at the top and captured and/or adhesively heat fixed at its lower (preform) extremity.

- 5 Preferably the distal end of said handle is at least mechanically captured by part of the body provided by the blown preform.

Preferably the injection/stretch blow moulded plastics container (preferably of PET) has a closure engageable neck to close the mouth or opening thereof and has extending from adjacent thereto an integral handle having, or which at least had, in its  
10 preform version, a distal end, said injection stretch blow moulded plastics container having being blown in a two part blow mould while being indexed to the centre line of the two part mould by or by reference to the handle of said preform.

Preferably biaxially oriented PET container has an integral handle structure attached to the shoulder thereof below the closure engageable neck thereof (which  
15 includes the mouth or opening), said neck, shoulder and handle each being of a form substantially as in their preform stage, said preform having been moulded and stretch blown prior to any substantial cooling below the stretch blow moulding temperature.

Preferably the preform was stretch blown in a two part blow mould using the integral handle of the preform to index to the centre line of the two part mould preferably  
20 while still being clamped at the closure engageable neck thereof by the multipart mould (preferably two piece with same part line as said two part blow mould) that moulded the clamped region(s) of said closure engageable neck.

Preferably the a biaxially oriented container is formed from PET or a plastics material having similar moulding characteristics, said container having been blown from  
25 a preform which included an integral handle structure while the preform was still being clamped at the closure engageable neck thereof by the multipart mould that moulded the clamped region of said closure engageable neck.

Preferably said multipart mould is a two piece mould.

Preferably the preform has been stretch blown in a two part blow mould.

- 30 Preferably said two part blow mould and said two piece mould that moulded the

clamped region(s) of said closure engageable neck have at least during the blow moulding process a common part line.

Preferably said common part line includes the integral handle structure.

Preferably said integral handle structure remains substantially unchanged from its  
5 form as moulded at the preform stage.

Preferably said integral handle structure includes a distal end remote from its integral attachment at or adjacent the neck of the preform.

Preferably said two piece mould that moulded the clamped region(s) of said closure engageable neck has also moulded a shoulder like part of said integral handle structure  
10 and has remained clamped thereon during the blow moulding stage so as to index the integral handle structure to said common part line.

Preferably said two part mould in which the preform is stretch blown such as to allow a capturing of the distal end of said integral handle structure by the body region of the container.

15 Preferably when stretch blown the preform is inflated to encompass a distal end region of the preform handle structure.

Preferably said distal end of the preform handle structure is positioned within the outer periphery (when viewed normal to the neck/shoulder axis of the bottle).

Preferably said bottle is one as previously set forth in any of its forms.

20 In yet a further aspect the present invention consists in a bottle substantially as hereinafter described or which is made by a process substantially as herein described and/or using apparatus hereinafter described.

The present invention consists in a stretch blow moulded plastics container having been formed by first an injection mould procedure and then by a stretch blow  
25 moulding of the injection moulded preform or parison, the invention being characterised in that

(a) in the injection moulding stage a handled preform is created having an integral handled to extend from a closure engageable neck or from below the closure engageable neck of the preform and to have a distal extremity capable of being captured and/or  
30 contacted when the barrel of the preform is blow moulded, said injection moulding being



performed using amongst other mould components at least a two part mould which moulds at least the exterior of said closure engageable neck of the preform, and

(b) said at least two part mould is used to index the preform with and to co-act with mould components of the stretch blow moulding station.

5 Preferably said at least two part mould is a two part mould with a part line at least substantially on a plane through the elongate axis of the preform or parallel thereto.

Preferably the partline of said two part mould is on the non distal region of said handle only.

Preferably said blow mould components are or include a two part mould with a part  
10 line at least substantially on a plane through the longitudinal axis of the blown barrel region of the container.

Preferably the two said part lines are substantially on a common plane.

Preferably said blow mould components included means to urge the distal extremity of the handle inwardly but then to move away therefrom so as to allow some  
15 handle extremity envelopment by the blown barrel of the preform.

In another aspect the invention consists in a method of manufacturing a bottle or container (hereinafter "bottle") of PET which comprises the steps of melting the PET,

forming from the molten PET, in a first mould assembly, a preform capable of  
20 being stretch blow moulded to the form of the bottle, said preform having a neck region which, once the bottle is formed, is to be engageable by a screw closure to close the mouth or opening thereof and having adjacent but below the threaded neck region, a handle or a precursor for a handle, said handle or precursor for a handle having a distal extremity region, and

25 without allowing the preform to cool (at least to any substantial degree) to a temperature or temperatures below the stretch blow moulding temperature for at least the barrel region thereof to be stretch inflated, in a second mould assembly, stretch blowing the barrel region of the preform to define said bottle,

and wherein (i) said preform after creation in said first mould assembly is  
30 manoeuvred by said neck and/or said handle by part of said first mould assembly into a

two part blow mould for said barrel region and is indexed relative to the centre line thereof by reference to the handle, said two part blow mould (plus its blow nozzle) and said part of first mould assembly form at least part of said second mould assembly, and/or

(ii) in the stretch blow moulding step, means deflects the tang or  
5 extremity of the handle inwardly towards the remainder of the preform for a sufficient period and is such a way as to enable a better wrap around of the distal regions of the tang or said extremity by the body of the bottle or container being blown from said barrel region, ie. by presenting the distal region of the handle more inwardly it encounters sooner the plastics material being blown which is both thicker at that position and hotter.

10 Preferably both (i) and (ii) occurs.

Preferably the part lines of those parts of the first mould assembly and those parts of the second mould assembly for said barrel region are substantially coincident.

Preferably said substantially coincident part lines are in a plane or planes that include said handle.

15 Preferably said means for deflecting the tang or extremity inwardly is means reproducibly moveable to achieve said deflection for a sufficient period of time yet to move so as not to substantially (if at all) interfere with the said wrap around.

Preferably said means is a pivotal member actuated by a reciprocating member such a pneumatic, hydraulic or solenoidal member.

20 Preferably said pivotal member is pivoted from a pivot axis which is substantially perpendicular to the general longitudinal axis of the preform and is (with respect to radial projections from the preform) not closer to the neck region of the preform than said distal end of the tang region of said handle.

In yet another aspect the invention consists in apparatus for providing an  
25 injection/stretch blow moulded PET container or a container of a plastics material having similar characteristics to that of biaxially oriented PET insofar as moulding requirements are concerned, said apparatus comprising

means providing a first mould assembly to mould from molten plastics feedstock a preform capable of being stretch blow moulded to form a bottle, said preform having a  
30 neck engageable with a screw closure to seal the mouth or opening thereof and having

adjacent a handle or a precursor for a handle having one distal extremity,

means forming part of said first mould assembly to present said preform into a second mould assembly of which said part forms part and to stretch blow mould the preform to define said bottle, and

- 5 means to open the second mould assembly and to allow and/or cause the removal of the completed bottle therefrom by said part of said first mould assembly.

Preferably said stretch blow mould assembly is a two part mould insofar as the barrel region of the preform is concerned.

- 10 Preferably said means to present and/or means to allow removal engages at least in part non distal regions of said handle or precursor thereof.

Preferably there is included means to at least momentarily move the distal extremity inwardly towards the barrel region as or prior to its being blown.

- In still a further aspect the invention comprises apparatus for providing an injection/stretch blow moulded PET container (or a container of a plastics material  
15 having similar characteristics of bi-axially oriented PET insofar as moulding requirements are concerned), said apparatus comprising

(I)(a) means to define injection mould cavities to define

- (i) the main body region of a preform to be capable of being blow moulded to form the body of a bottle or container, said cavity having a general elongate axis, and  
20 (ii) a tang region of an integral handle of the preform which likewise has a general longitudinal axis to a distal end thereof, said two general longitudinal axes being substantially parallel,

- (b) an assembly of radially separable (with respect to the thread of the closure engageable neck of the preform being formed) mould parts capable of defining the outer  
25 surface of the neck and/or head regions of the preform and the upper (or outer) surface of a shoulder-like part of said integral handle from which said tang region depends, said mould parts being separable at least on a separation line which includes said shoulder-like part, and

- (c) a mould part to define the inside of the preform and the mouth or opening  
30 thereof,

at least one or more of the mould components allowing the injection of plastics into the moulding cavity to the configuration of said preform,

(II) means to remove said preform once formed from said mould parts I(a) and I(c) while it is still being held by mould parts I(b),

5 (III) a two part blow mould into which the preform of (II) can be contained and blown while still associated with mould parts I(b).

Preferably said I(a) parts include a form to define at least the underside of said shoulder-like part.

10 Preferably said two part blow mould (III) includes means to allow the wrap around of said distal end by the blown container body.

Preferably means during and/or prior to the blowing step is provided to urge said distal end towards said blow mouldable part of said preform.

In other aspects the invention comprises a blow moulded PET container (or a container of a plastics material having similar characteristics to that of a biaxially oriented PET insofar as moulding requirements are concerned) that has been blown

(a) a method as previously defined and/or

(b) apparatus as previously defined.

In still a further aspect the present invention consists in a blow moulded PET container (or a container of a plastics material having similar characteristics to that of a biaxially oriented PET insofar as moulding requirements are concerned) that has been blown using a preform in accordance with the present invention prior to its being cooled substantially below (if at all) blow moulding temperatures or has been blown from a parison formed by such a preform after appropriate reheating to blow moulding temperatures, or using a method in accordance with the present invention or using

20 apparatus in accordance with the present invention or in a manner substantially as hereinafter described with reference to anyone or more of the accompanying drawings or any combination of any of the foregoing.

#### **BRIEF DESCRIPTION OF DRAWINGS**

In a less preferred form said preform is a previously moulded parison ie. may be

30 used after cooling to ambient temperatures. This however creates some difficult in

reheating the preform uniformly for stretch blow-moulding because of the integral handle.

A preferred form of the present invention will now be described with reference to the accompanying drawings in which:

Figure 1 is a side elevation view of a preferred bottle in accordance with the present invention showing the neck with its screw-fit feature to enable engagement with a closure to seal the opening or mouth thereof and having a shoulder positioned there below from which an integral handle (which was present in the preform) extends and which has a distal end region preferably mechanically captured by the blow-moulded body region,

Figure 2 is a view "AA" of the bottle of Figure 1,

Figure 3 is a plan view "BB" with respect to the bottle of Figure 1,

Figure 4 is a similar side elevation view to that of Figure 1 but of the preform thereof, the neck, shoulder and body precursors of the bottle of Figure 1 being shown in section, the preform showing extending from the shoulder region the preferred form of preform handle structure, and

Figures 5A through 5C show in sequence :

Figure 5A - the carrying of the preform after it has been moulded in the injection stations of the injection stretch blow moulding machine by a handling structure which engages to or carries at least in part by the handle structure for subsequent indexing purposes,

Figure 5B - where the arrangement of Figure 5A has been indexed into a two part blow-mould, the handle being preferably used as a reference to the centre line of the preferred two part mould,

Figure 5C - showing how, after opening of the mould, the structure of Figure 5A can carry the completed bottle for release at a product collection zone,

Figure 6 is a perspective view of a more preferred form of preform clearly showing a strengthened form of handle over that depicted in, for example, Figure 4, the integral handle region of the preform being essentially of two parts, ie. a tang region that extends substantially parallel to the longitudinal preferably circular section of the preform and a shoulder-like region from at or adjacent the neck regions of the preform to the non-distal end region of the tang region. preferably that shoulder-like region being sufficiently

strengthened by appropriate cross-sectional configuration, ie. webbing, ribbing etc. so as to render it reasonably rigid,

Figure 7 is a perspective view of tooling in accordance with the present invention showing by means of the cross hatching those surfaces of various mould parts that need not break (if at all) at that particular part line but showing in relation to the closure engaging region of the mould cavity one of preferably two mould parts that not only define the closure engaging thread but are capable of defining at least in part of the upper or outer surface of said handle and being used in concert to remove a moulded preform from the cavities while at the same time indexing the handle (preferably with its axis) for location subsequently with respect to a blow mould,

Figure 8A is the same as Figure 7 showing the apparatus as it would be as the apparatus is about to be charged with the plastics material to form the preform, Figures 7 & 8A not showing cooling conduiting within parts of the mould that are useful to ensure a preferential cooling of the handle and neck regions of the preform (rather than the blow mouldable regions),

Figure 8B shows a preform injection moulded by such cavities,

Figure 8C shows the next stage, ie. the removal of the mould part from internally of the preform,

Figure 8D is the next stage with sliding out of the preform from its mould cavities while still being retained by the two part mould piece which has defined in the preferred form not only the threaded region but also the outer or upper surface of the shoulder-like region from at or adjacent the neck to the tang region of the handle, and which separation will allow the carousel or other like movement of the preform with respect to the cross hatched mould pieces to the blow mould,

Figure 9A follows on from 8D but showing a blowing nozzle or mandrel capable of engaging the supporting two part mould carrying the preform and/or the preform itself when within the blow mould cavity and showing one part of the preferred two part blow mould which will preferably have a part axis indexed to the handle and in common with the preform carrying mould parts and which preferably includes reproducible moveable means which is actuatable (for example by pneumatic ram - not shown) to bias the handle towards the body portion of the preform.

Figure 9B shows the apparatus in its assembled form ready for blow moulding with the pivoted member just making contact with the tang region of the handle,

Figure 9C is a similar view to that of Figure 9B but showing the inward deflection of the tang region of the handle such that the distal end regions thereof encounter the  
5 blown preform plastics material while it is both thicker and hotter to achieve a better wrap around of the distal end region and thus its capture,

Figure 9D shows the preform having been blow moulded to achieve such a capture even as the pivoted means moves clear of the capturing plastics material for the distal end region, there being some natural bias on the handle to move outwardly to retain its  
10 engagement by the capturing blow moulded material,

Figure 9E shows yet a further stage with the blow mould being separated at the part line which is preferably coincident with the part line of the two part mould pieces engaging the closure engageable regions of the neck and/or head,

Figure 9F shows the uplifting of the apparatus away from the mould cavity,

15 Figure 9G shows the separation of the still retained container from the blow moulding head, and

Figure 10 shows the thus blow moulded container after the part line separation of the two parts of the apparatus that previously both formed the screw thread and part of the shoulder-like of the handle piece of the preform and of course supported it and indexed  
20 it during the subsequent stages.

In the preferred form of the present invention the plastics material is PET and is formed into a preform as shown in Figure 4. This preform 1 has a neck region 2, a shoulder region 3 and a body region 9. The handle 4, preferably in its final form, extends from the shoulder 3 and defines a distal region 5 which may be captured by the blown  
25 body as shown in Figure 1.

Since the preform of the kind depicted in Figure 4, if cooled to become a parison, presents difficulties for homogeneous heating to a stretch blow moulding temperature [if there is to be reliance on radiant heat or conduction] owing to the presence of the integral handle in the preferred form of the present invention the preform is not cooled to become  
30 a parison but is a preform that is only momentarily in existence and is preferably kept at or above a temperature at which it can be stretch blow moulded after it has been formed

from the molten PET. The method of forming can be conventional but preferably as indicated by reference to Figures 5A through 5C the apparatus 6 which carries the preform, by indexing to the handle structure 8 can ensure appropriate location of the handle 8 in the blow mould 7.

5        Preferably each of the stages of 5A through 5C take place on part of a carousel of a injection stretch blow-moulding machine of substantially a conventional form but which has been modified to accommodate a preform having an integral handle or to be moulded with said integral handle and to have the handle indexed into the blow mould and released therefrom.

10        A preferred form of the preform as shown in Figure 6. It includes a blow-mouldable region 9 which is preferably substantially of circular section but may not be a true annulus in cross-section since some weighting of the material to accommodate for standard moulding practices and the shape of the container may be required, thus resulting in slight variations in wall thickness to achieve the best moulding of the product by a  
15        standard blow-moulding technique and yet resulting in a product with the requisite strength. Similarly in relation to the closed bottom end.

      The preform as shown in Figure 6 includes a tang region 10 of its handle which extends substantially parallel (with respect to its longitudinal axis) to the corresponding general longitudinal axis of the body member 9. The distal end 11 of the tang region 10  
20        is preferably such that the preform is capable of being uplifted in a direction parallel to the said general longitudinal axes away from the distal end. This is important in order to simplify tooling. Nevertheless, in some forms of the present invention, forms of the distal end 11 can be envisaged that through the rounding, bulbing, or the like may nevertheless be extractable in a similar direction from tooling.

25        The general neck region 30 of the preform [preferably below the single or multi start threaded region 14 and the ratchet like means 15 (for tamper evident closures and/or for child proof closures)] defines a shoulder-like region 12 that extends to a region 13 where the tang 10 proper commences. The shoulder-like region 12 is preferably provided with a cross-section by means of webs or the like such that a two part mould capable of  
30        separation from the longitudinal axis of the shoulder-like 12 can achieve the requisite moulding. Preferably the tang region 10 and its distal end is such that a simple cavity is



all that is required provided the tang 10 can be uplifted therefrom upon being pulled directly or indirectly by the shoulder-like region 12.

A preferred tool arrangement is shown in Figure 7 where the outer member 16 is shown with cross hatching to show what is not necessarily a part line and preferably is not, although could be for the purpose of simplifying manufacture. Likewise the inner member 17 which as a plug locates with respect to the members 16 upwardly from below and opening to allow the movement of plastics is provided at 18 from below via an injection nozzle.

Also shown in Figure 7 cross hatched so as to indicate a surface that has been broken and need not be a part line is the member 19 which has the function of defining the inner surface of the preform. The member 19 co-acts with a mould part 20 which does mate at a part line which is in the same plane as the cross hatched surfaces of each of the members 16, 17 and 19. This mould part defines the threaded region of the preform as well as the upper surface of the shoulder-like region to the tang region. Indeed the region 21 defines the indented regions 22 of the preform shown in Figure 6.

Not illustrated in Figure 7 for convenience are the means whereby fluid passage is achieved through the metal mass of mould part 16 to achieve selective cooling of the tang and/or shoulder-like regions of the preform. Likewise in respect of the members 17, 20 and 19 which may include some provision for heat exchange by use of a non-mingling heat exchange liquid or conductive cooling to such a liquid.

Figure 8A through 9 shows a series of steps from the time of mould assembly on a machine through to the time of preform extraction for movement to a blow moulding zone or station.

Figure 8A shows the arrangement where it is then possible to inject plastics material into the mould cavity.

Figure 8B shows the plastics material as it is after having filled the mould cavity.

Figure 8C shows the arrangement upon the uplifting of the mould part 19 from within the preform body 9 and clear of the head thereof.

Figure 8D shows how in a machine such as SBIII series machines sourced from Aoki Technical Laboratories Inc, of Nagano-ken, Japan how it is possible for mated mould parts to uplift the preform after preliminary cooling such that the neck and handle

regions retain their configuration for movement into a blow-mould while there is still sufficient heat retention in the body region 9, such uplifting being possible without any opening of the mould parts from which it has been withdrawn.

Figure 9 shows how a machine such as an Aoki SBIII series machine can use the members 20 that have moved the preform extracted from the moulding process of Figures 8A through 8D for positioning within a two part blow mould one half of which is shown as 24 in Figure 9A.

There then follows the procedure as depicted in Figures 9A through 9G whereby there is first a presenting of the clamped preform to the open blow-mould, a positioning of the members 20, the blow-mould head 25 and the preform 23 as appropriate to the blow-mould which is then closed, and thereafter the ensuing blowing and extraction procedures, such extraction again being achieved utilising the association of the two part mould 20 with the closure engagement region and the shoulder-like of the handle of the preform.

A blow-moulded container as shown in Figures 10 results with a wrap around at 26 of the distal end region 11 of the preform 23.

A characteristic of blow moulding is that a handle of a preform as shown if left unconstrained against radial outward movement would be deformed outwardly in the blow-mould under the gas pressure within the blown body 9. There is a preference to restrain the handle so that the appropriate association with the blown body can best take place. It has been found possible by a timed urging of the tang region inwardly towards the body 9 (as shown from the conditions shown in Figure 9B to the condition shown in Figure 9C) to achieve a better wrap around provided the means 27 is moved clear to allow such wrap around at the strategic time and to allow opening of the blow mould cavity halves.

The small amount of deflection between the condition of the distal end of the tang shown in Figure 9B through to that shown in Figure 9C is such that a thicker body of the region 9 of the preform while hotter than would otherwise be the case contacts the distal end 11 thus giving rise to a better association and wrap around as the member 27 times its withdrawal to allow the continuation of such a wrap around.

The member 27 is preferably driven about its pivot axis 28 by appropriate means

such as a pneumatic ram that would connect at 29 and its timing of movement between the conditions shown throughout Figures 9A to 9G would be such as to maximise the wrap around at 26.

The air cylinder which actuates the pivoted member (in and out) preferably is  
5 activated by the same signal as the stretcher rod cylinder (up and down). The timing of the stretcher rod action in relation to the blow valve being activated is through a timed delay ie; blow initiated (low pressure), delay before stretcher rod down initiated, high pressure blow, high pressure blow times out, stretcher rod up, blow mould opens.

Preferably the pivoted member is held 'in' through the total blowing cycle although  
10 it could be timed to retract once the preform is fully inflated (preferably within 0.5 sec of initial blow signal). It is highly preferred that the pivoted member is retracted before the blow mould is opened; otherwise the product would be damaged as the support area would be entrapped in the blown contours of the bottle.

Obviously reciprocal means to inwardly urge the tang are possible as to of course  
15 are forms that naturally configure the preform to be disposed more inwardly but without sufficient strength to prevent its withdrawal from a simple mould as shown in Figure 7. Such other constructions are within the ambit of the present invention but the lighter weight forms, but with the urging as depicted, are the most preferred.

Persons skilled in the art will appreciate how the present invention provides a clear  
20 alternative to existing methods of providing handles for containers or bottles where the integral handles are not capable of being provided by existing technologies available for plastics such as bi-axially oriented PET.

**CLAIMS:**

1. A stretch blow moulded plastics container having been formed by first an injection mould procedure and then by a stretch blow moulding of the injection moulded preform or parison, the invention being characterised in that
  - 5 (a) in the injection moulding stage a handled preform is created having an integral handled to extend from a closure engageable neck or from below the closure engageable neck of the preform and to have a distal extremity capable of being captured and/or contacted when the barrel of the preform is blow moulded, said injection moulding being performed using amongst other mould components at least a two part mould which
    - 10 moulds at least the exterior of said closure engageable neck of the preform, and
    - (b) said at least two part mould is used to index the preform with and to co-act with mould components of the stretch blow moulding station.
2. A container of claim 1 wherein said at least two part mould is a two part mould with a part line at least substantially on a plane through the elongate axis of the preform
  - 15 or parallel thereto.
3. A container of claim 2 wherein the partline of said two part mould is on the non distal region of said handle only.
4. A container of claim 1 or 2 wherein said blow mould components are or include a two part mould with a part line at least substantially on a plane through the longitudinal
  - 20 axis of the blown barrel region of the container.
5. A container of claim 4 wherein the two said part lines are substantially on a common plane.
6. A container of claims 4 or 5 wherein said blow mould components included means to urge the distal extremity of the handle inwardly but then to move away therefrom so
  - 25 as to allow some handle extremity envelopment by the blown barrel of the preform.

7. A method of manufacturing a bottle or container (hereinafter "bottle") of PET which comprises the steps of

melting the PET,

forming from the molten PET, in a first mould assembly, a preform capable of

5 being stretch blow moulded to the form of the bottle, said preform having a neck region which, once the bottle is formed, is to be engageable by a screw closure to close the mouth or opening thereof and having adjacent but below the threaded neck region, a handle or a precursor for a handle, said handle or precursor for a handle having a distal extremity region, and

10 without allowing the preform to cool (at least to any substantial degree) to a temperature or temperatures below the stretch blow moulding temperature for at least the barrel region thereof to be stretch inflated, in a second mould assembly, stretch blowing the barrel region of the preform to define said bottle,

and wherein (i) said preform after creation in said first mould assembly is  
15 manoeuvred by said neck and/or said handle by part of said first mould assembly into a two part blow mould for said barrel region and is indexed relative to the centre line thereof by reference to the handle, said two part blow mould (plus its blow nozzle) and said part of first mould assembly form at least part of said second mould assembly, and/or

(ii) in the stretch blow moulding step, means deflects the tang or  
20 extremity of the handle inwardly towards the remainder of the preform for a sufficient period and is such a way as to enable a better wrap around of the distal regions of the tang or said extremity by the body of the bottle or container being blown from said barrel region, ie. by presenting the distal region of the handle more inwardly it encounters sooner the plastics material being blown which is both thicker at that position and hotter.

25 8. A method of claim 7 wherein both (i) and (ii) occurs.

9. A method of claim 7 or 8 the part lines of those parts of the first mould assembly and those parts of the second mould assembly for said barrel region are substantially coincident.

10. A method of claim 9 wherein said substantially coincident part lines are in a plane  
30 or planes that include said handle.

11. A method of any one of claims 7 to 10 wherein said means for deflecting the tang or extremity inwardly is means reproducibly moveable to achieve said deflection for a sufficient period of time yet to move so as not to substantially (if at all) interfere with the said wrap around.

5 12. A method of claim 11 wherein said means is a pivotal member actuated by a reciprocating member such a pneumatic, hydraulic or solenoidal member.

13. A method of claim 12 said pivotal member is pivoted from a pivot axis which is substantially perpendicular to the general longitudinal axis of the preform and is (with respect to radial projections from the preform) not closer to the neck region of the preform  
10 than said distal end of the tang region of said handle.

14. Apparatus for providing an injection/stretch blow moulded PET container or a container of a plastics material having similar characteristics to that of biaxially oriented PET insofar as moulding requirements are concerned, said apparatus comprising

15 means providing a first mould assembly to mould from molten plastics feedstock a preform capable of being stretch blow moulded to form a bottle, said preform having a neck engageable with a screw closure to seal the mouth or opening thereof and having adjacent a handle or a precursor for a handle having one distal extremity,

means forming part of said first mould assembly to present said preform into a  
20 second mould assembly of which said part forms part and to stretch blow mould the preform to define said bottle, and

means to open the second mould assembly and to allow and/or cause the removal of the completed bottle therefrom by said part of said first mould assembly.

15. Apparatus of claim 14 wherein said stretch blow mould assembly is a two part  
25 mould insofar as the barrel region of the preform is concerned.

16. Apparatus of claim 15 wherein said means to present and/or means to allow removal engages at least in part non distal regions of said handle or precursor thereof.

17. Apparatus of any one of claims 14 to 16 including means to at least momentarily  
30 move the distal extremity inwardly towards the barrel region as or prior to its being

blown.

18. Apparatus for providing an injection/stretch blow moulded PET container (or a container of a plastics material having similar characteristics of bi-axially oriented PET insofar as moulding requirements are concerned), said apparatus comprising

5 (I)(a) means to define injection mould cavities to define

(i) the main body region of a preform to be capable of being blow moulded to form the body of a bottle or container, said cavity having a general elongate axis, and

(ii) a tang region of an integral handle of the preform which likewise has a general longitudinal axis to a distal end thereof, said two general longitudinal axes being  
10 substantially parallel,

(b) an assembly of radially separable (with respect to the thread of the closure engageable neck of the preform being formed) mould parts capable of defining the outer surface of the neck and/or head regions of the preform and the upper (or outer) surface of a shoulder-like part of said integral handle from which said tang region depends, said  
15 mould parts being separable at least on a separation line which includes said shoulder-like part, and

(c) a mould part to define the inside of the preform and the mouth or opening thereof,

at least one or more of the mould components allowing the injection of  
20 plastics into the moulding cavity to the configuration of said preform,

(II) means to remove said preform once formed from said mould parts I(a) and I(c) while it is still being held by mould parts I(b),

(III) a two part blow mould into which the preform of (II) can be contained and blown while still associated with mould parts I(b).

25 19. Apparatus of claim 18 wherein said I(a) parts include a form to define at least the underside of said shoulder-like part.

20. Apparatus of claim 16 or 19 wherein said two part blow mould (III) includes means to allow the wrap around of said distal end by the blown container body.

21. Apparatus of any one of claims 18 to 20 wherein means during and/or prior to the  
30 blowing step is provided to urge said distal end towards said blow mouldable part of said

preform.

**22. A blow moulded PET container (or a container of a plastics material having similar characteristics to that of a biaxially oriented PET insofar as moulding requirements are concerned) that has been blown**

- 5 (a) a method of any one of claims 7 to 13 and/or**  
**(b) apparatus of any one of claims 14 to 21.**



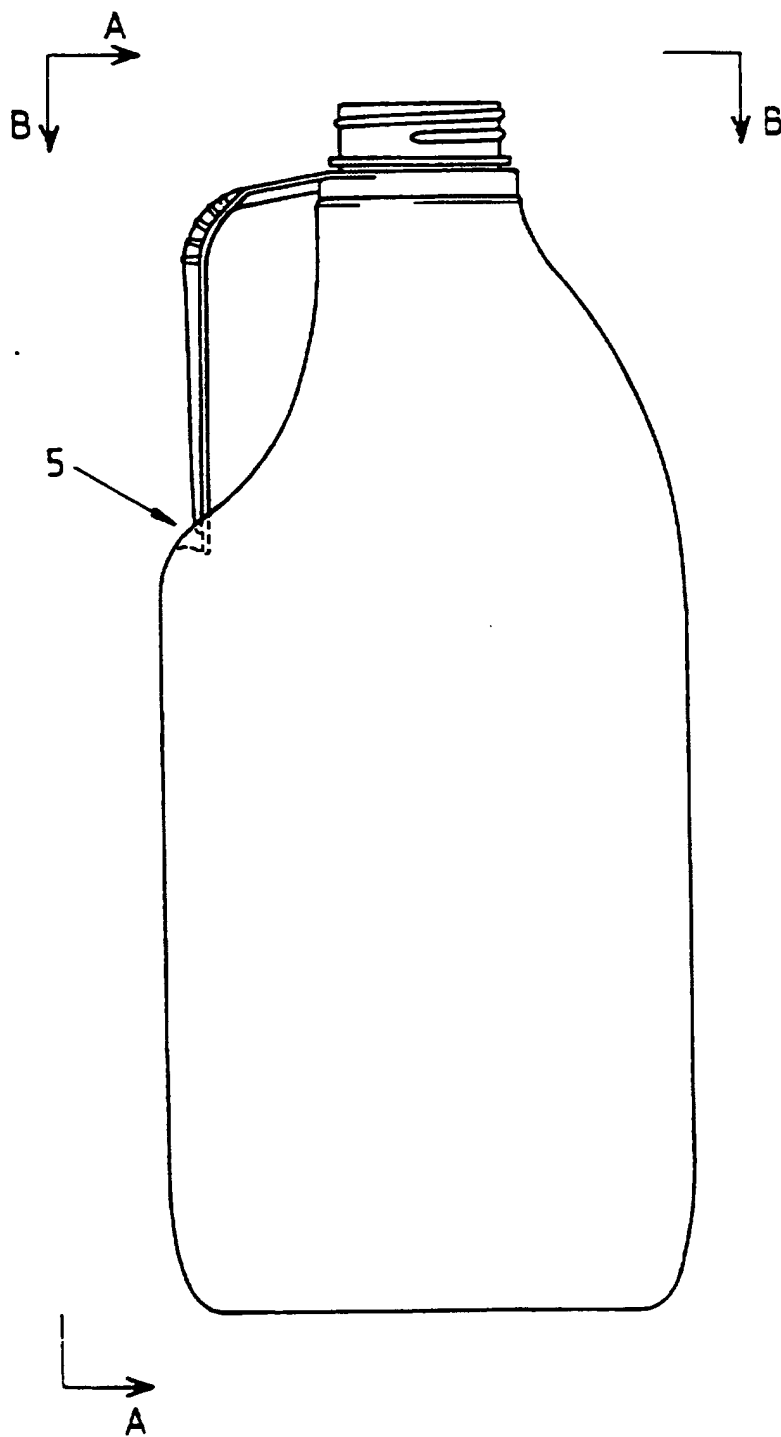


FIG 1

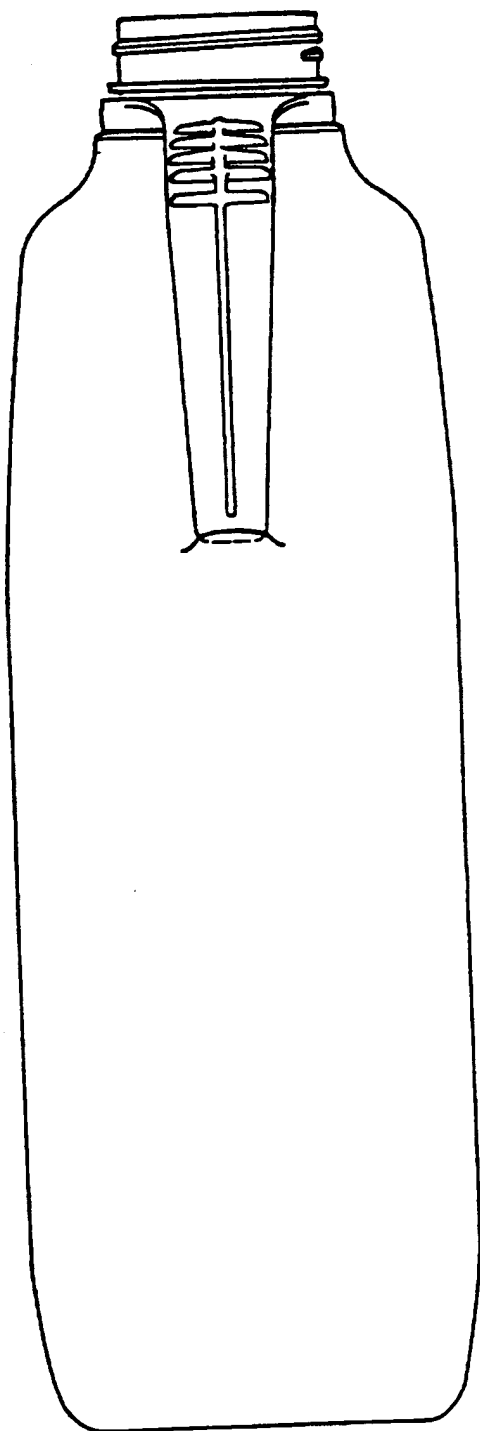


FIG 2

FIG 3

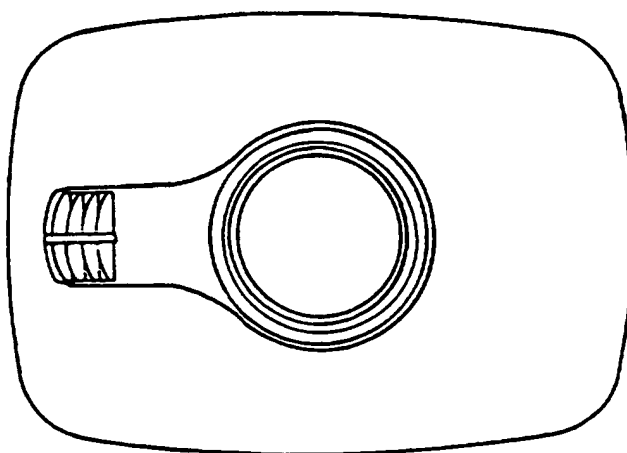
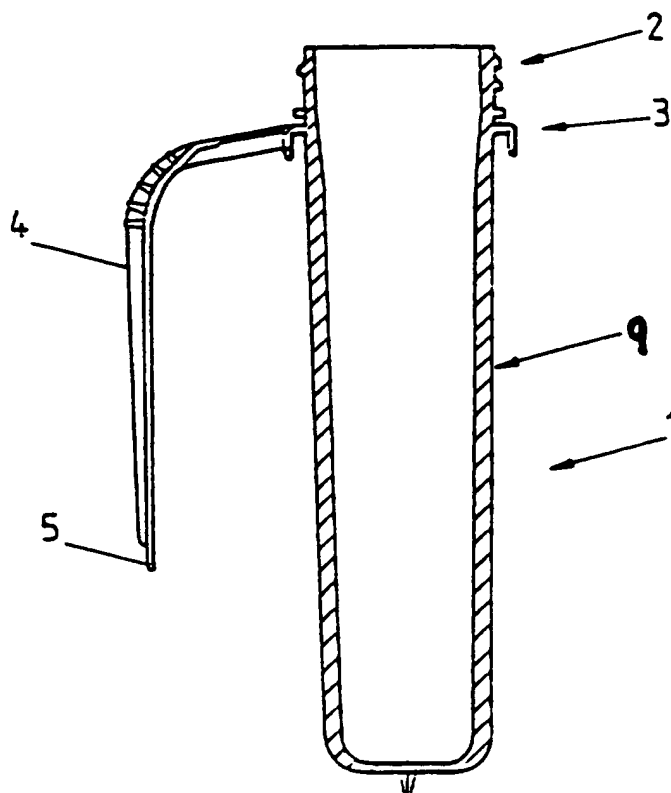


FIG 4



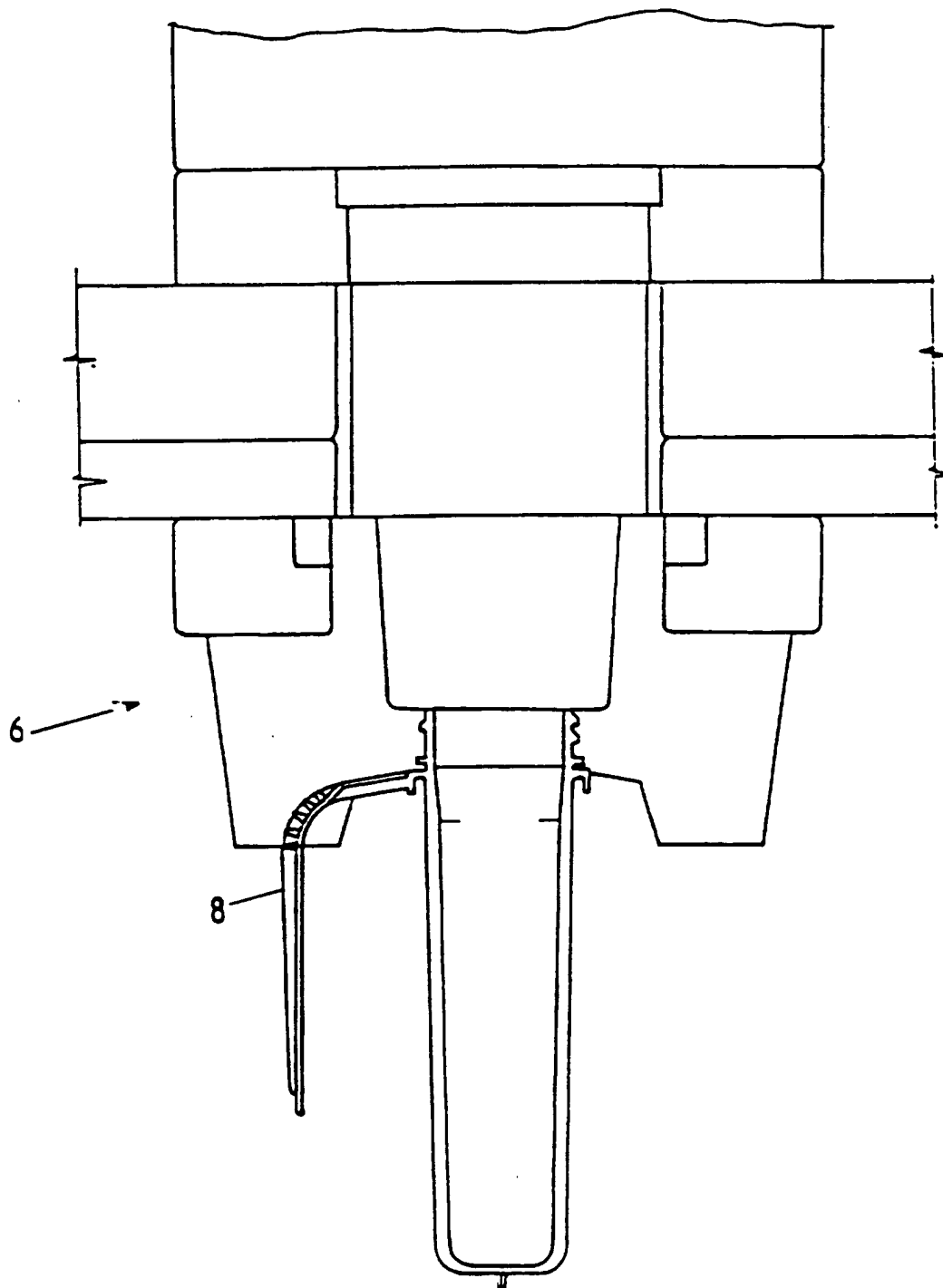


FIG 5A

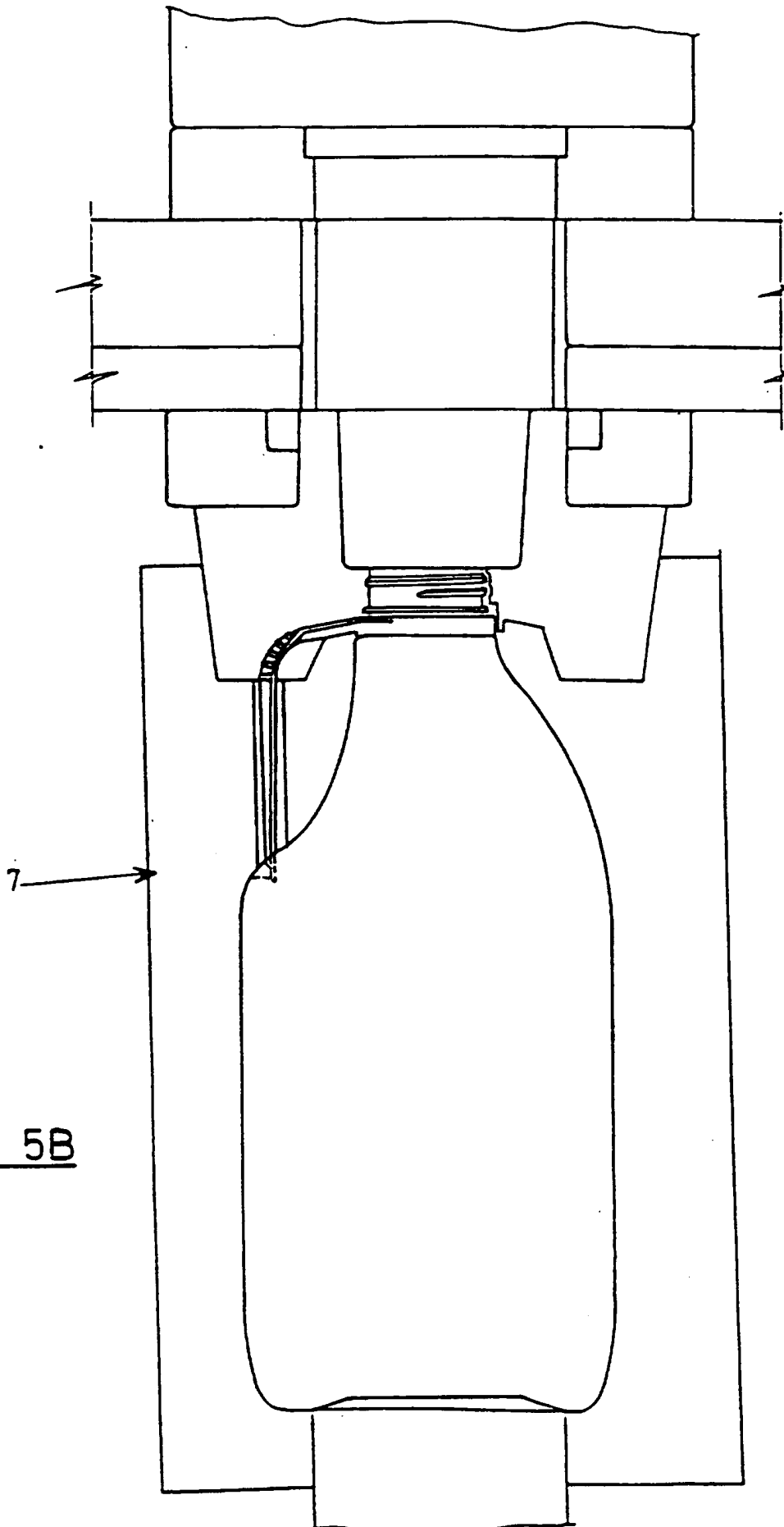


FIG 5B

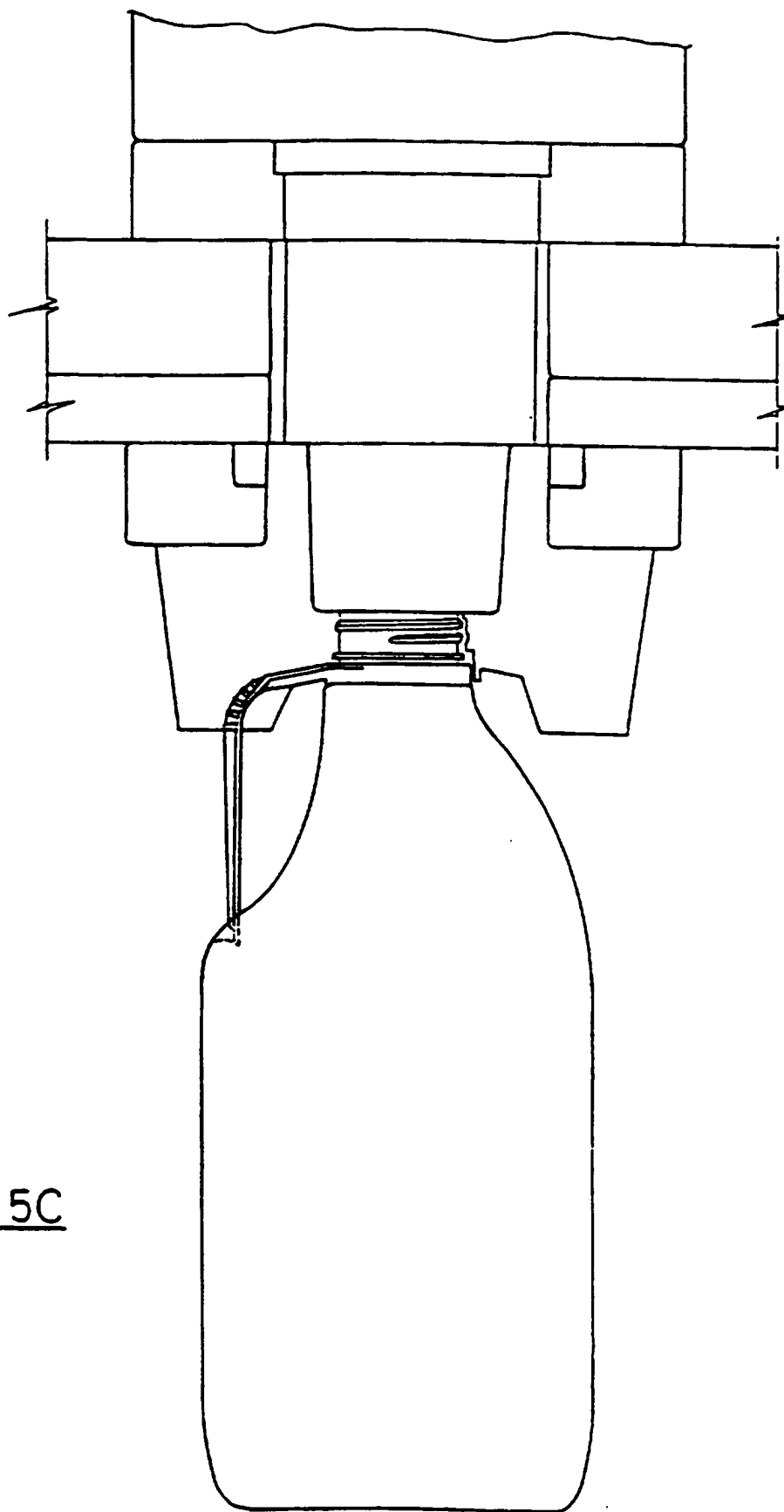


FIG 5C

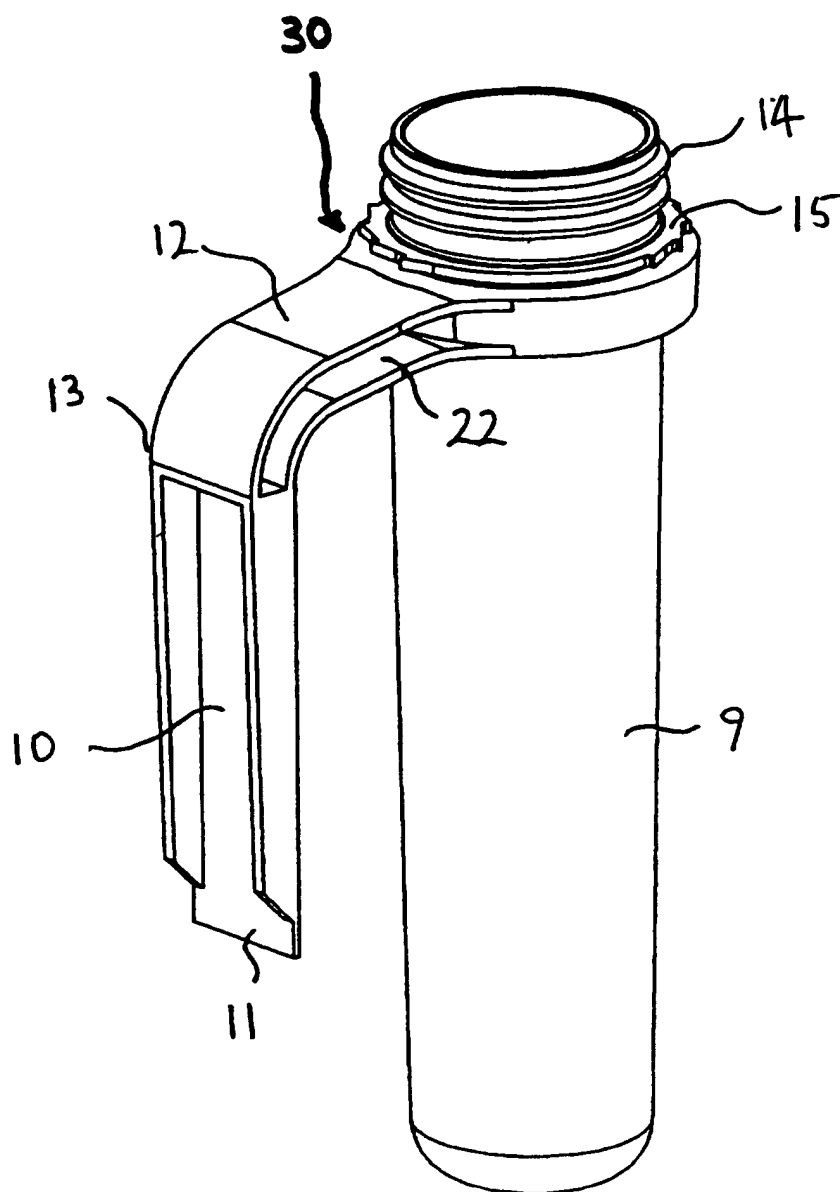
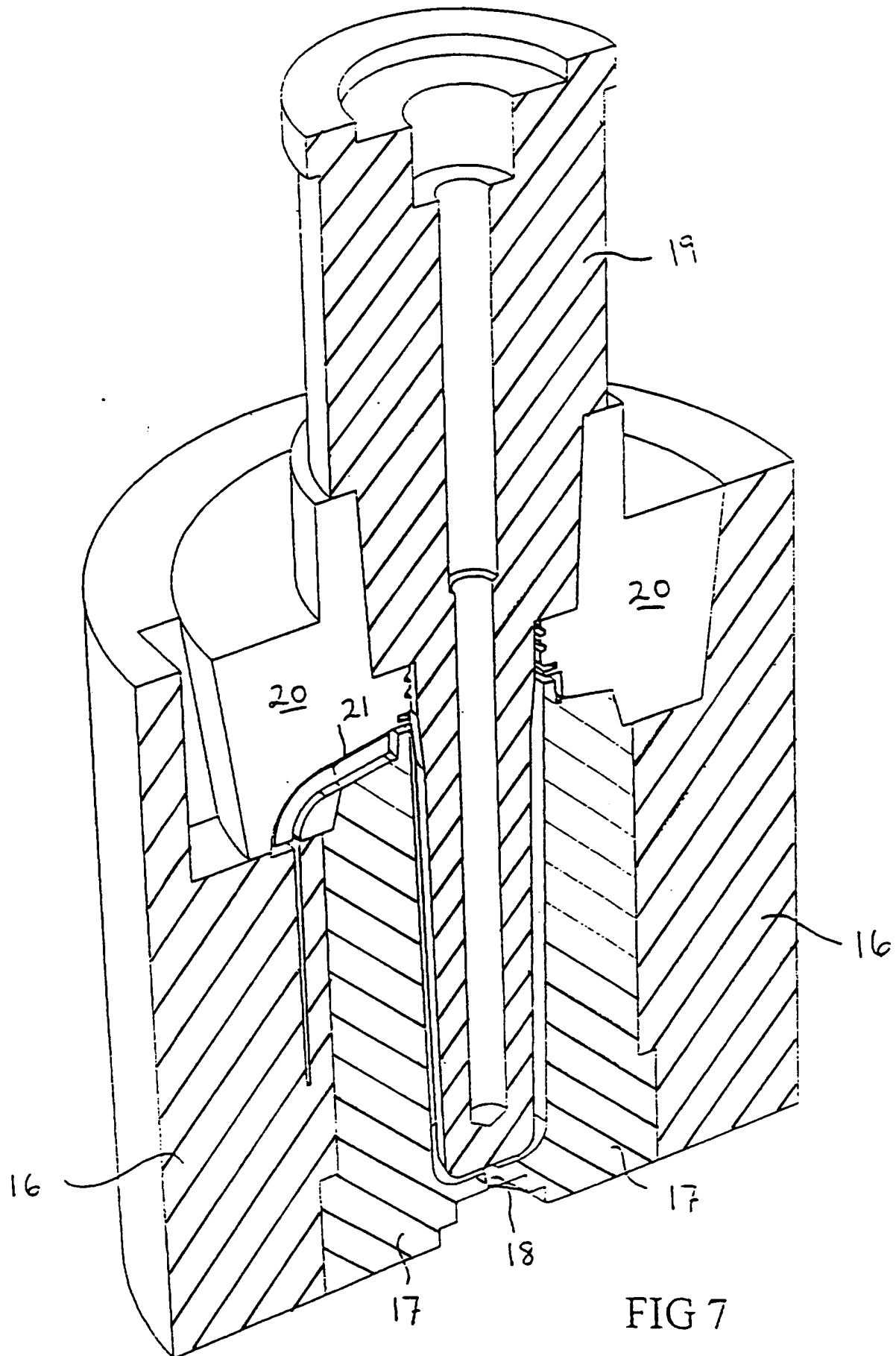


FIG 6





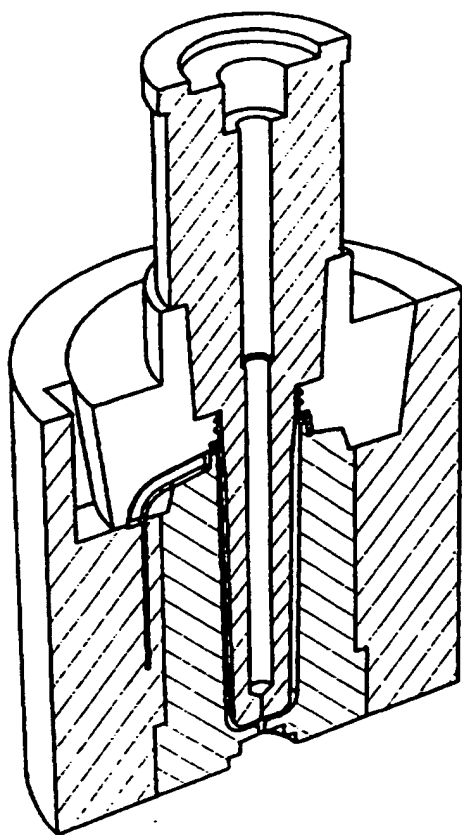


FIG 8A

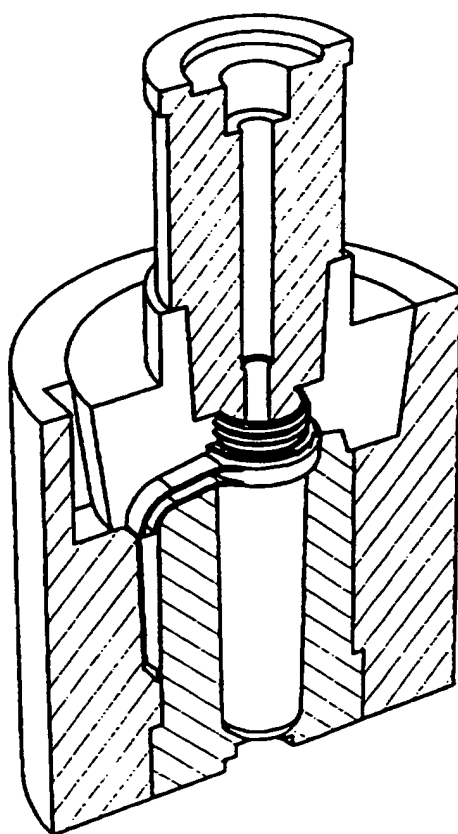


FIG 8B

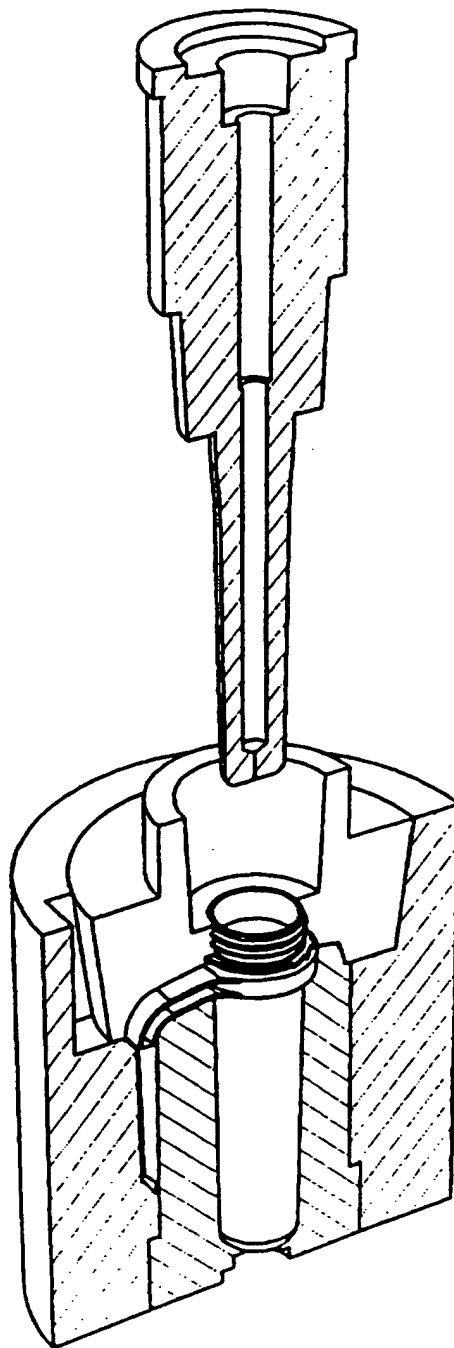


FIG 8C

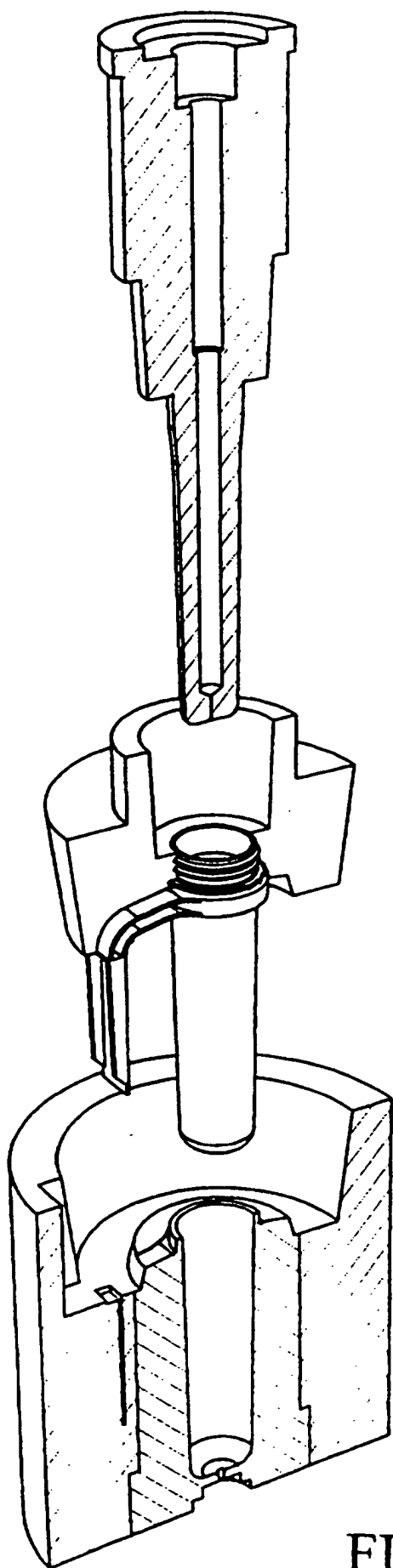


FIG 8D

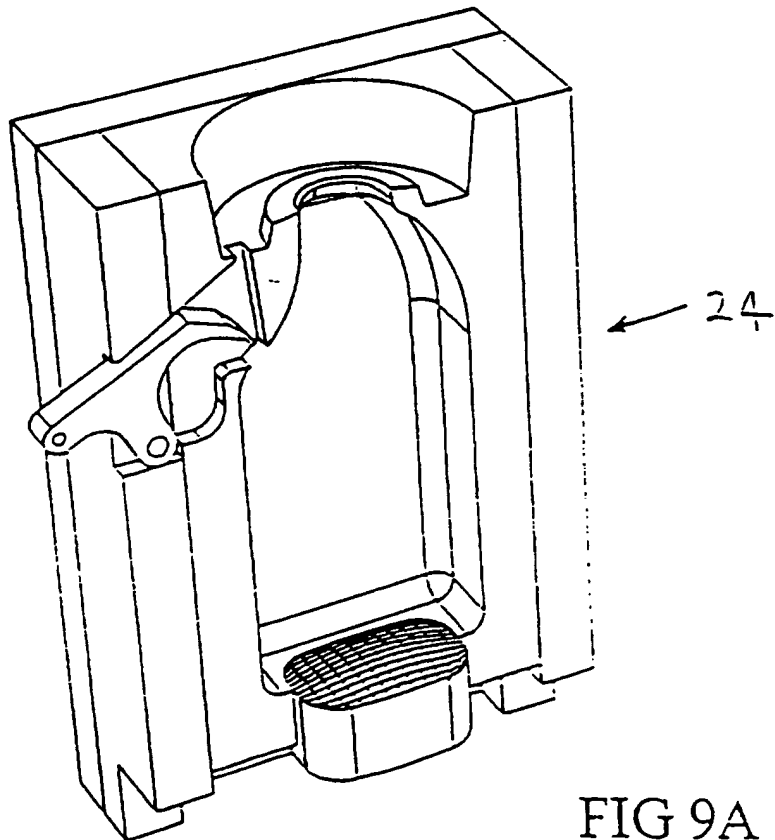
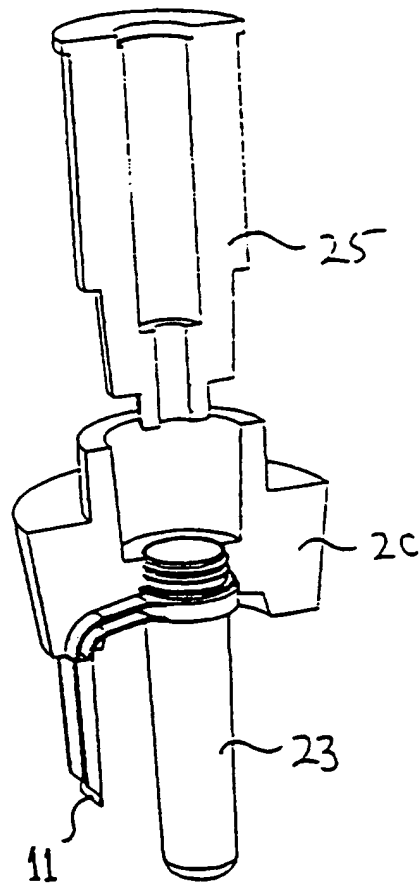


FIG 9A

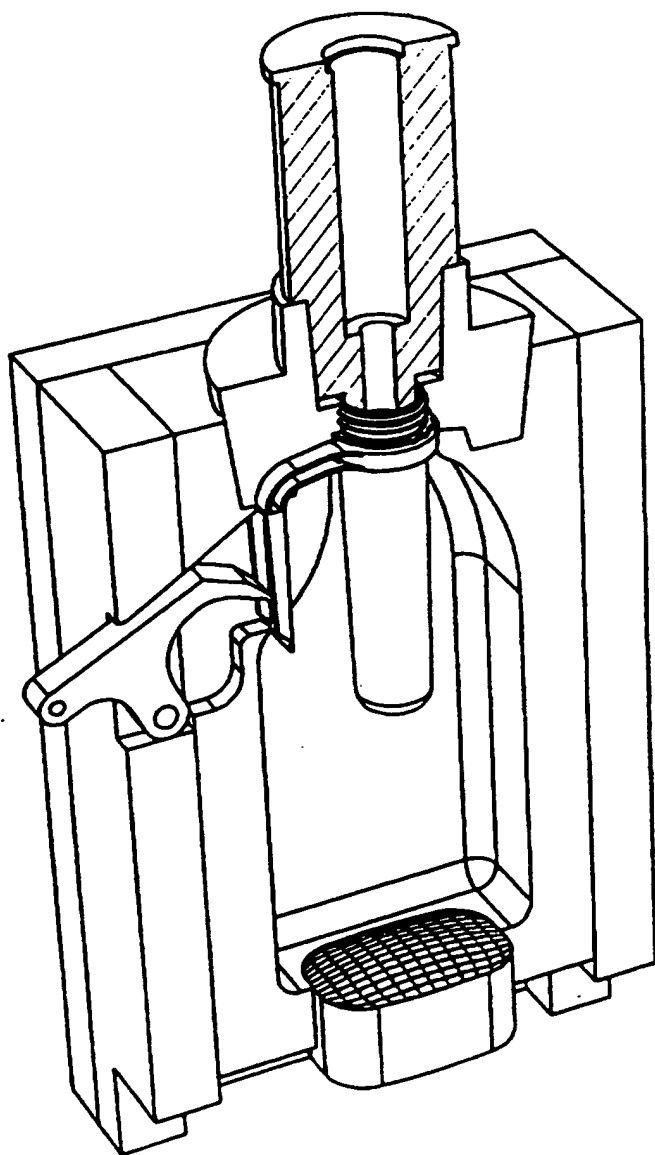


FIG 9B

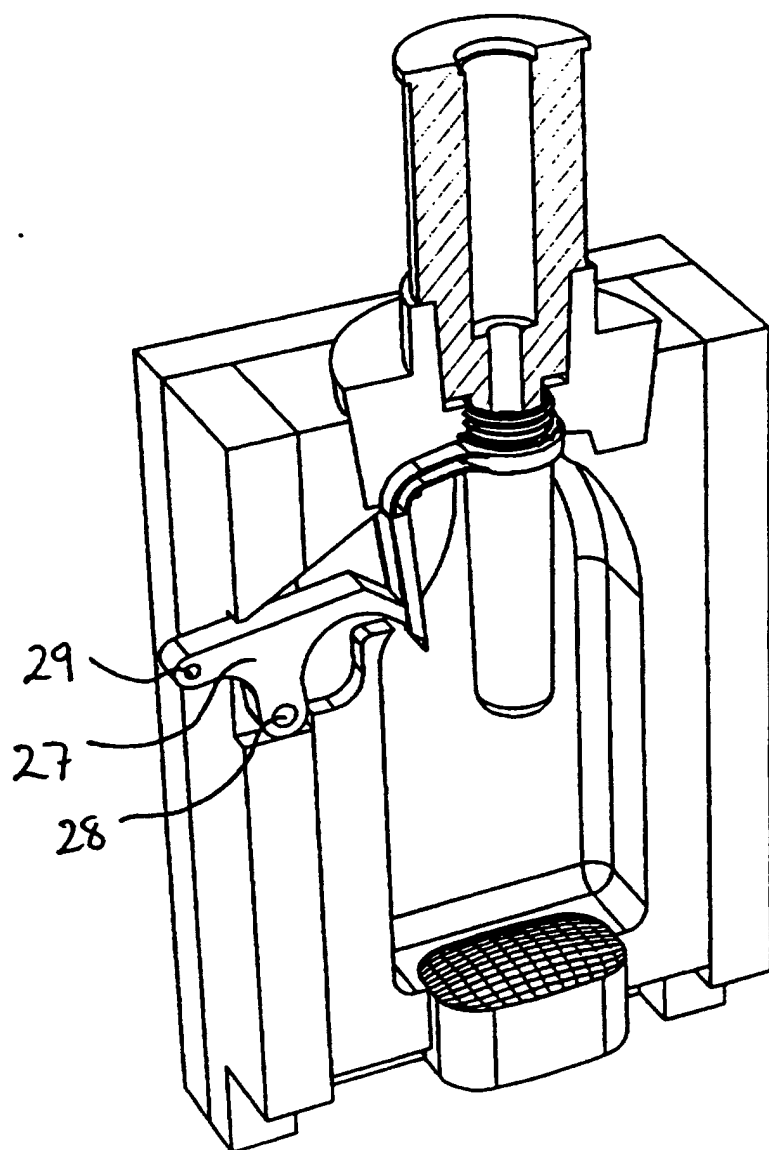


FIG 9C

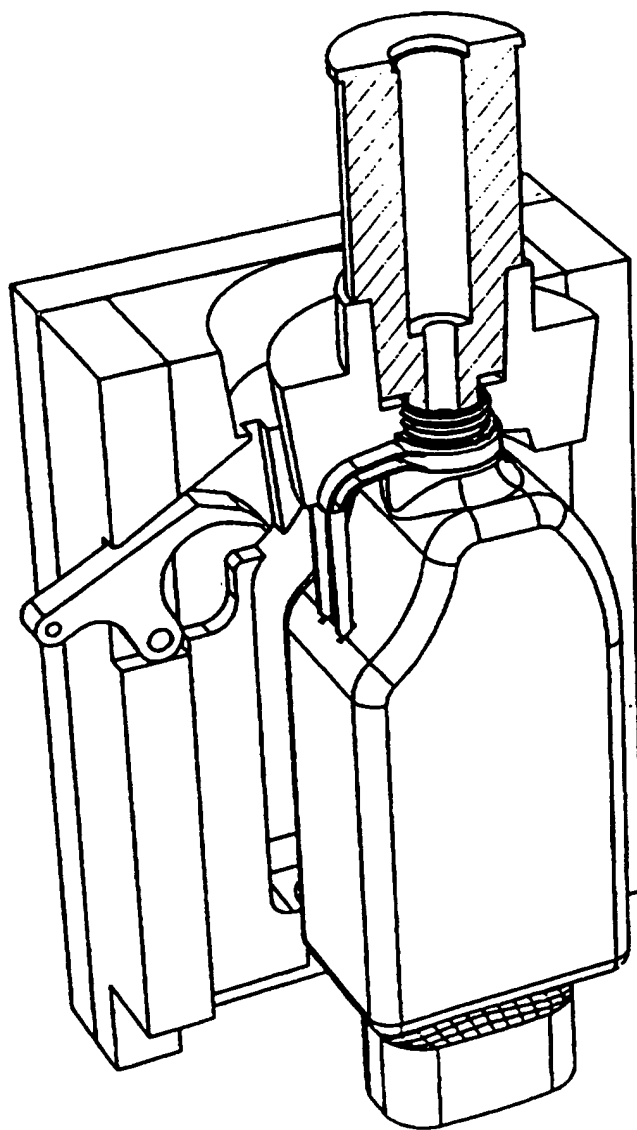


FIG 9E



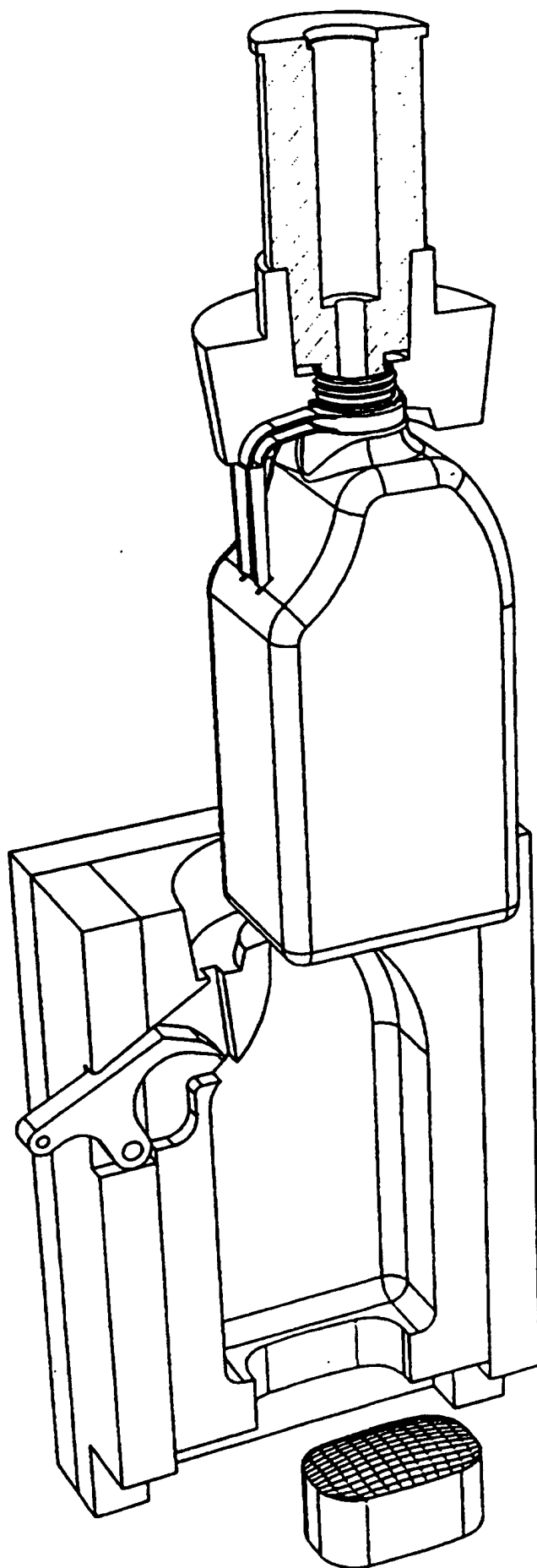


FIG 9F

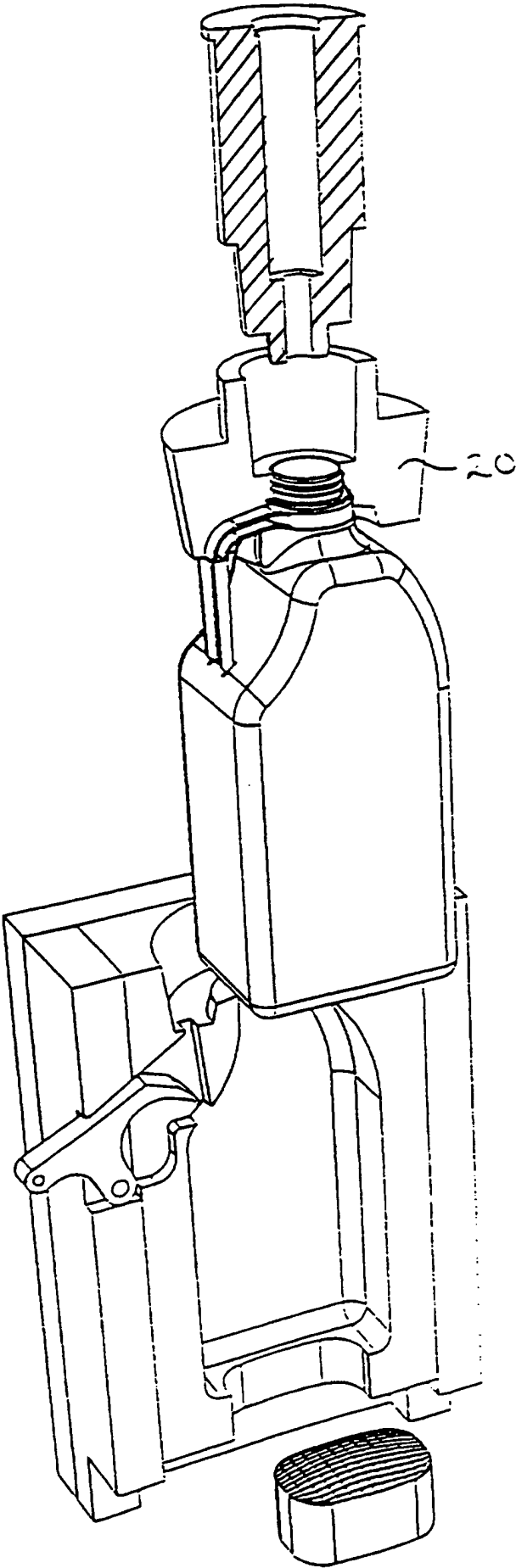


FIG 9G

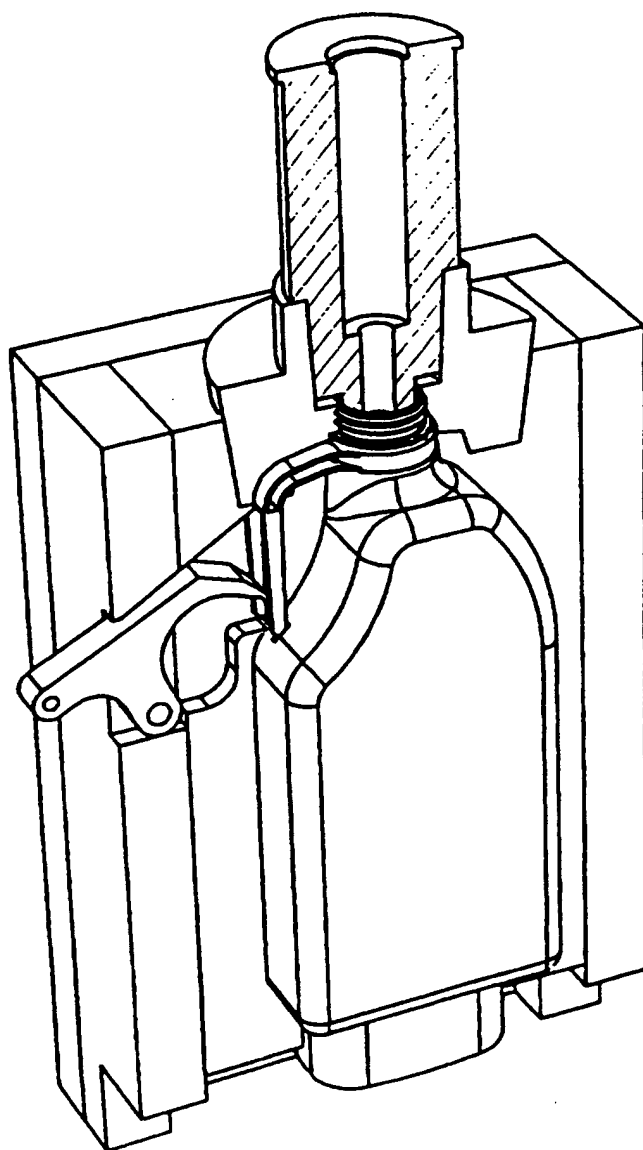


FIG 9D

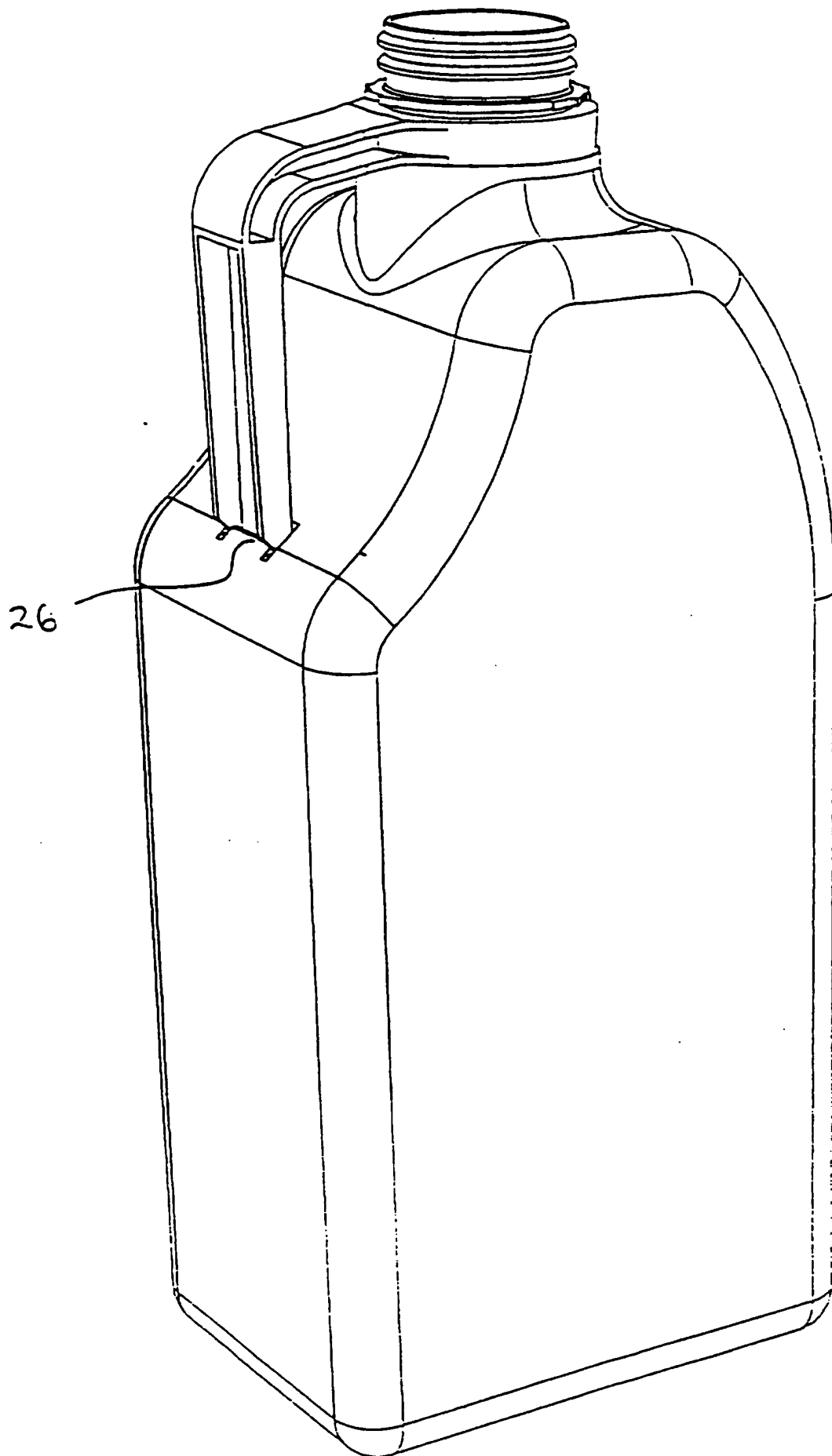


FIG 10

# INTERNATIONAL SEARCH REPORT

International Application No.

PCT/NZ 96/00022

## A. CLASSIFICATION OF SUBJECT MATTER

Int Cl<sup>6</sup>: B29C 49/06, 49/30, 49/70 // B29K 67:00, B29L 22:00

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Int. Cl. B29C 49/06, 49/30, 49/70, B29D 23/03, 1/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

AU : Int. Cl. as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

Derwent WPAT and Japio : Int Cl as above and (neck : or thread or handle:)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	US 4629598 A (THOMPSON) 16 December 1996 Figure 4, column 5 line 16 to column 6 line 7	7 1 - 22
X Y	Patents Abstracts of Japan, M-1133, page 28, JP 03-90331 A (NISSEI S B KIKAI KK) 16 April 1991	7 1 - 22
Y	Patent Abstracts of Japan, M1217, page 17 JP 03-268907 A (TOPPAN PRINTING CO LTD) 29 November 1991	1 - 22



Further documents are listed in the continuation of Box C



See patent family annex

<p>* Special categories of cited documents:</p>	
"A" document defining the general state of the art which is not considered to be of particular relevance	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"E" earlier document but published on or after the international filing date	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

4 June 1996

Date of mailing of the international search report

19TH JUNE 1996

Name and mailing address of the ISA/AU  
AUSTRALIAN INDUSTRIAL PROPERTY ORGANISATION  
PO BOX 200  
WODEN ACT 2606  
AUSTRALIA Facsimile No.: (06) 285 3929

Authorized officer

ROGER HOWE

Telephone No.: (06) 283 2159

# INTERNATIONAL SEARCH REPORT

International Application No.

PCT/NZ 96/00022

C (Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	FR 2541622 A (COPY) 31 August 1984 Figure 1.	1 - 22
Y	US 4311246 A (SAITO et al) 19 January 1982 Figures	1 - 22
Y	US 4439393 A (SAITO et al) 27 March 1984 Figures	1 - 22
Y	US 4076484 A (ARMOUR et al) 28 February 1978 Column 5 lines 32-53	1 - 22
Y	EP 566995 A (NISSEI ASB MACHINE CO., LTD) 27 September 1993 Abstract	1 - 22
Y	EP 585859 A (NISSEI ASB MACHINE CO., LTD) 9 March 1994 Abstract	1 - 22
Y	EP 228324 A (NISSEI ASB MACHINE CO., LTD) 8 July 1987 Abstract	1 - 22
Y	US 3609803 A (FATTORI) 5 October 1971 Abstract	1 - 22
Y	US 4233021 A (SPURR) 11 November 1980 Abstract	1 - 22
Y	GB 2149341 A (KATASHI AOKI) 12 June 1985 Abstract	1 - 22

# INTERNATIONAL SEARCH REPORT

International Application No.

PCT/NZ 96/00022

## Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:  
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a)

## Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. Claims 1, 7 (i), 14, 18 which share the special technical feature of a handled preform wherein the neck mould from forming the preform is used to transport to and index the preform to the blow mould.
2. Claim 7 (ii) which has the special technical feature of the extremity of the handle deflected into the blow mould so as to join the handle to the body of the container.

As the two sets of claims do not share a common special technical feature they relate to different inventions.

Note: Claim 7 allows for option (i) and /or (ii)

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims
2. ☒ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

- Remark on Protest
- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.